May 24, 2006
NSBRI-RFP-06-01

National Space Biomedical Research Institute
One Baylor Plaza, NA-425
Houston, TX 77030

NSBRI Announcement Soliciting Postdoctoral Fellowship Applications

A Request for Proposals for the
National Space Biomedical Research Institute

Letters of Intent Due: **June 22, 2006**
Applications Due: **July 20, 2006**

TABLE OF CONTENTS

NSBRI Request for Proposals Soliciting Postdoctoral Fellowship Applications

Summary and Supplemental Information

This National Space Biomedical Research Institute (NSBRI) Request for Proposals (NSBRI-RFP) is soliciting applications for the Postdoctoral Fellowship Program. Postdoctoral Fellowships will be competitively available for two years in any laboratory in the United States carrying out space-related biomedical/biotechnological research in accordance with the NSBRI's goals. **The program is open to U.S. citizens, permanent residents, or persons with pre-existing visas obtained through their sponsoring institutions that permit postdoctoral training for the project's duration. To be eligible for this program, applicants may not have more than three years of previous postdoctoral training.** Selected Postdoctoral Fellows will become a **member of an integrated countermeasure development team** of the NSBRI.

The Postdoctoral Fellowship award will be funded as a stipend of $40,000 for the first year with an 5% increase in the second year, and will include an allowance for health insurance. Additional funding will be provided for travel to a mandatory NSBRI meeting of Fellows at the annual NSBRI/NASA meeting as well as to a domestic scientific meeting of the Fellow's choice. The Fellow will also be expected to spend 3-5 days at the NASA Johnson Space Center to become familiar with the research facilities and programs available at that institution. The time period for the Johnson Space Center visit will be arranged by the Fellowship Program and will occur during the summer of 2007. **A budget is not necessary for completion of an application.** Funding is not provided for administrative costs, supplies or equipment. The mentor is responsible for supervision of the NSBRI Postdoctoral Fellow and for providing necessary funds for supplies and equipment. After Postdoctoral Fellowships have been awarded, the NSBRI will work with the funded institutions to execute the awards, which will include development of a budget for funding. **Indirect costs will not be awarded to the funded institution.** Additionally, the NSBRI's traditional cost sharing of 10% of the funded award is welcomed, but not required, from institutions who receive awards for postdoctoral training.

Applicants must prepare proposals with the support of a mentor and institution (university, national lab, etc.), and all proposals will be evaluated by a peer-review panel. Mentors should have previous experience training postdoctoral fellows and/or graduate students. **It is the responsibility of the Postdoctoral Fellowship Applicant to arrange for a mentor.**

The NSBRI is interested primarily in supporting research, in the Countermeasure Readiness Level (CRL) range of 3-7 and/or Technology Readiness Level (TRL) range of 3-7. The research project will be a part of a countermeasure development team focused on advancing the research toward an applied intervention that can be evaluated and validated at CRL 7-8. Applicants should refer to Figures 1-4 in Appendix A for a detailed description of the CRLs and TRLs. Each applicant must identify what CRL and/or TRL their research proposal addresses.

In this NSBRI-RFP,

- Appendix A provides an introduction and overview of the goals, objectives, and implementation strategies of NSBRI.
- Appendix B contains descriptions of the opportunity, specific instructions for submitting a Letter of Intent, and instructions for proposal submission.
- Appendix C contains the standard Instructions for Responding to NSBRI Requests for Proposals**.**
- Appendix D contains copies of the certifications required to be followed with any signed application.

The NSBRI's scientific and educational goals are to fund research and development that will result in the delivery of countermeasures to ensure the health of astronauts, and to apply findings from the research to benefit life on Earth. The NSBRI is committed to maintaining a strong, openly competitive, peer-reviewed research program. The Institute also aims to inspire the next generation of space life scientists. Proposals submitted in response to this NSBRI-RFP must address the research emphases described in this document (see Appendix B for more details). Those that do not will be returned without review.

Proposals that synergistically bridge multiple disciplines for the purpose of modeling the effects of microgravity on the human body, aid in the development and testing of countermeasures, or develop technologies that enable research in one or more NSBRI research areas are strongly encouraged.

All proposals will be evaluated for overall scientific and technical merit by a peer-review panel. Relevance to NSBRI's programmatic needs and goals will also be evaluated by NSBRI Management. Funds are not currently available for awards under this NSBRI-RFP. The NSBRI's obligation to make award(s) is contingent upon the availability of appropriated funds from which payment can be made and the receipt of proposals that the NSBRI determines are acceptable for award under this NSBRI-RFP.

Inclusion of Women and Minorities in Research Involving Human Subjects – NASA and the NSBRI have adopted the NIH policy regarding this matter. Women and members of minority groups and their subpopulations must be included in NSBRI-supported biomedical and behavioral research projects involving human subjects, unless a clear and compelling rationale and justification are provided that inclusion is inappropriate with respect to the health of the subjects or the purpose of the research.

Participation in this NSBRI-RFP is open to all categories of organizations, industry, educational institutions, other nonprofit organizations, NASA laboratories, and other agencies of the U.S. government.

An electronic Letter of Intent from applicants is requested, but not required, by June 22, 2006. Proposals must be submitted electronically by **July 20, 2006, 5:00 p.m. Eastern Time.** (See Appendix B of this NSBRI-RFP for specific instructions for these activities.)

The following items apply only to this NSBRI-RFP:

Solicitation NSBRI-RFP Identifier:	**NSBRI-RFP-06-01**
Application Format Required:	**Electronic application using NSBRI's Electronic Proposal Submission System (See Appendix B for further information.)**
Letters of Intent Due (not required):	**June 22, 2006**
Proposals Due:	**July 20, 2006, 5 p.m. ET**
Selection Announcement:	**Fall 2006**
Funding Begins:	**Approximately 30-90 days following notification of selection**
Selecting Official:	**Director, National Space Biomedical Research Institute**

Information about the NSBRI and its existing research program is available from:

Jeanne Becker, Ph.D.
Associate Director
National Space Biomedical Research Institute
One Baylor Plaza, NA-425
Houston, TX 77030-3498
Telephone: 713-798-7412
Fax: 713-798-7413
Email: director@www.nsbri.org

Information about the NSBRI Postdoctoral Fellowship Program is available from:

Sonia Rahmati Clayton, Ph.D.
Project Coordinator
NSBRI Postdoctoral Fellowship Program
Email: postdoc@www.nsbri.org
Telephone: 800-798-8244

All prospective applicants to this NSBRI-RFP are advised that the highest priority in all of NASA's programs is given to safety and mission assurance, occupational health, environmental protection, information technology, export control, and security. NASA's safety priorities are to protect (i) the public, (ii) astronauts and pilots, (iii) the NASA workforce (including employees working under NASA instruments), and (iv) high-value equipment and property. All proposals submitted in response to this solicitation are expected to comply with this policy.

NSBRI points of contact will be identified in selection letters to begin the funding process. Potential investigators should read with care the program descriptions that are of interest and focus their proposals on the specific research emphases defined in this NSBRI-RFP.

Your interest and cooperation in participating in this effort is appreciated.

Original signed by

Bobby R. Alford, M.D.
Chairman of the Board and CEO
National Space Biomedical Research Institute

APPENDIX A
NSBRI-RFP-06-01

Background Information

Opportunities for a Postdoctoral Fellowship with the National Space Biomedical Research Institute

I. Introduction

The NSBRI is a NASA-initiated and -funded, nonprofit research consortium charged with developing biomedical countermeasures for potential health problems that could occur in astronauts either during long-duration space flight or on their return to Earth. The NSBRI's current program consists of approximately 75 science and technology projects organized into research teams. NSBRI research and development is aligned with the Vision for Space Exploration.

It is critical for applicants to read carefully <u>all</u> of the instructions in this NSBRI-RFP. In addition, each Appendix includes guidelines, requirements, and instructions for preparing and submitting proposals, and defines the administrative policies governing the particular components described in this NSBRI-RFP.

II. Bioastronautics Roadmap (BR)

In order to identify and make publicly known the biomedical risks of space flight and the research questions that must be answered to reduce those risks, NASA has developed the Bioastronautics Roadmap (BR). The BR is an interdisciplinary tool to assess, understand, mitigate, and manage the risks to humans that are associated with long-term exposure to the space environment. It assumes an overarching strategy that integrates requirements, risks, risk factors, research and technology questions, tasks, deliverables, and risk mitigation with the intent of directing biomedical research in support of human space flight, especially human missions of exploration. The BR is based in part on recommendations from internal NASA experts, NSBRI scientists, advisory committees representing the United States science community, task forces, and published reports such as the National Research Council (NRC) Space Studies Board's "A Strategy for Research in Space Biology and Medicine in the New Century;" the Aerospace Medical Advisory Committee; the NASA Task Force on Countermeasures; the International Space Life Sciences Working Group's publications on Radiation, Bone, Muscle, Cardiovascular, Human Factors, and Neuroscience Workshops; and the NASA Medical Policy Board Document.

The ultimate goal of the BR is to protect the health and safety of space flight crews by allowing NASA and the community of scientists to better define and focus the research that is required for development and validation of operational health care "deliverables" for the prevention, treatment, and rehabilitation of space flight changes and of appropriate habitation and medical care systems.

The current BR identifies 45 risks and 462 questions. A more extensive overview, as well as a list of all the risks and research and technology questions for the BR, should be reviewed by potential investigators at http://bioastroroadmap.nasa.gov/index.jsp.

The applicant must examine and understand the BR and specify in their proposal the rationale and evidence underlying which risks and research and technology questions their proposed research will address. An example is shown in Table I. A blank BR form can be downloaded from NSBRI's Electronic Proposal Submission System (EPSS). NSBRI will perform a similar assessment to understand how the proposed research addresses the BR risks and research and technology questions. Proposals that do not identify which BR risks and questions are being addressed will be returned to the applicant without review.

The NSBRI uses annual reports to assess progress relative to stated research objectives and hypotheses as declared in the original grant proposal by the Postdoctoral Fellow. It is imperative that the reports indicate how the investigation relates to BR research and technology questions. The applicant must understand that reporting of progress on an annual basis shall be required and shall be linked to BR risks and research and technology questions. In addition, the final report shall address the entire scope of the project rather than the final year and shall be linked to BR risks and research and technology questions.

TABLE I

EXAMPLE ONLY – Please complete BR Form for specific proposal.

Hypotheses	Risk Number **(from BR)**	Research and Technology Question Number **(from BR)**	Research and Technology Question **(from BR)**	Specific Aim
In the hindlimb unloaded (HLU) rat model, the combined administration of zoledronate with parathyroid hormone affords greater protection against femur fracture, relative to treatment with either agent alone; all agents whether administered alone or in combination will enhance bone quality and reduce fracture risk, as compared to non-treated control animals.	Risk #1 Accelerated Bone Loss and Fracture Risk	1d	What biophysical modalities, nutritional modifications, and pharmacological agents (alone or in combination) will most effectively minimize the decrease in bone mass due to extended hypogravity exposure? [ISS 1, Lunar 5, Mars 1]	#1: Measure bone mass and mineral density in HLU rats treated with zoledronate in the absence or presence of parathyroid hormone.
	Risk #1 Accelerated Bone Loss and Fracture Risk	1b	Will a period of rapid bone loss in hypogravity be followed by a slower rate of loss approaching a basal bone mineral density (BMD)? What are the estimated site-specific fracture risks as one approaches basal BMD? [ISS 2, Lunar 5, Mars 1]	#2 Evaluate mechanical strength of femur in HLU rats treated with zoledronate in the absence or presence of parathyroid hormone.
Additional hypotheses as required.				

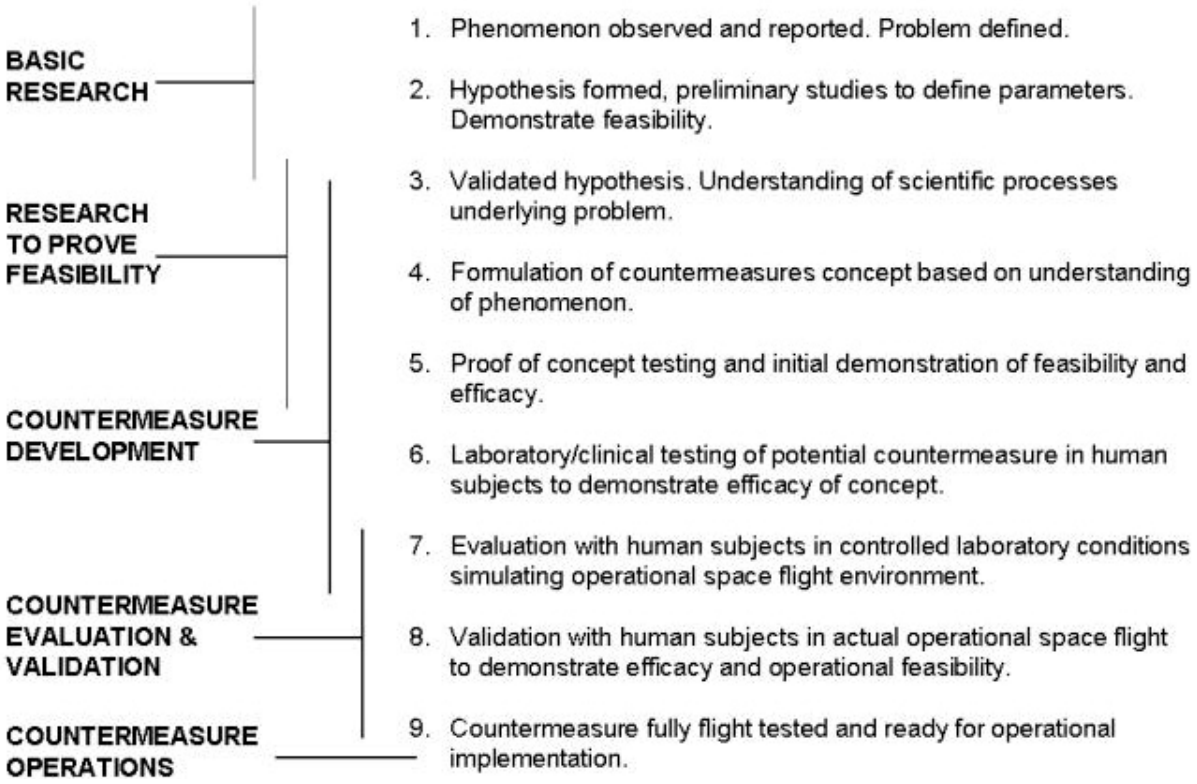
III. Countermeasure Readiness Level (CRL)/Technology Readiness Level (TRL)

Countermeasure Readiness Level (CRL)

The CRL scale allows NASA and the NSBRI to define, assess, and quantify the level of "countermeasure readiness." The use of this scale allows NSBRI Management to determine and describe how each funded research project fits into the countermeasure development "flow" and to monitor progress in countermeasure development. This section describes this scale and how it is used. **Each applicant must examine and understand the CRL scale and specify in the application the CRL that will result from the funding and conduct of their proposed research.**

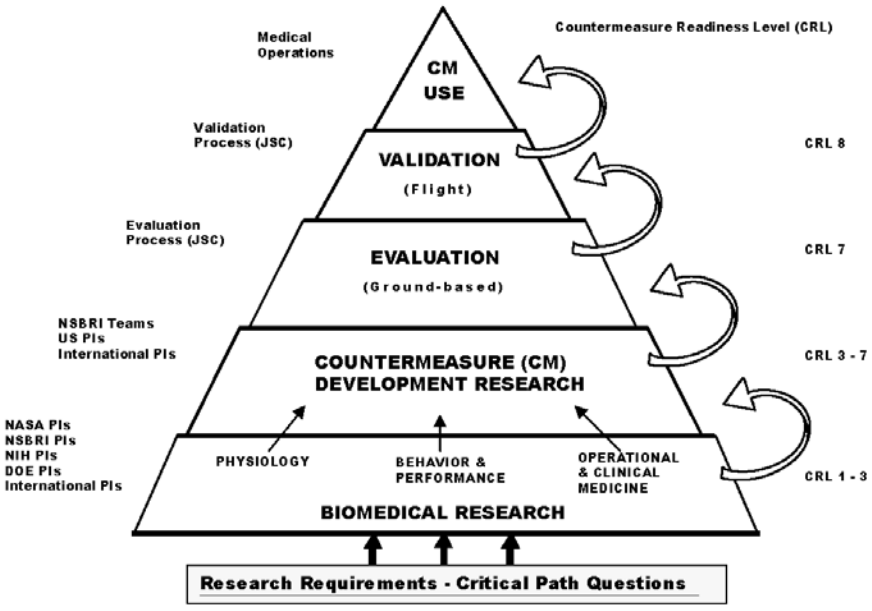
Figure 1 illustrates the CRL scale, which describes the level of scientific maturity of HSRT research from the fundamental studies that suggest potential countermeasures to studies that allow the systematic evaluation and validation of countermeasures ready for operational implementation.

Figure 1. Countermeasure Readiness Level Scale



Countermeasure development usually progresses through systematic research. Research flows through various levels of countermeasure readiness. Figure 2 represents this general progression. The boundaries between the types of activities are approximate. A potential countermeasure ready for validation in flight is one that has a thorough, successful history of ground-based, clinical, and/or flight analog testing.

Figure 2. Countermeasure Development Process



Technology Readiness Level (TRL)

Technology Readiness Level (TRL) is a systematic metric/measurement system that supports assessments of the maturity of a particular technology and the consistent comparison of maturity between different types of technology. (See Figures 3 and 4.)

The TRL system was adopted by NASA's space program for project tracking and management and was incorporated in NASA's 1991 Integrated Technology Plan. The TRL system was originally designed for traditional engineering programs with specific requirements and products.

There are nine TRLs, which can be grouped into five general categories:

- Basic research in new technologies and concepts.
- Focused technology development addressing specific technologies for one or more potential identified applications.
- Technology development and demonstration for each specific application before the beginning of full system deployment.
- System development (through first unit fabrication).
- System 'launch' and operations.

The TRL system is a means to assess the level of maturity of a particular technology and provide a consistent standard of comparison between technologies. In short, a TRL is a technology milestone.

Figure 3. Technology Readiness Level Scale

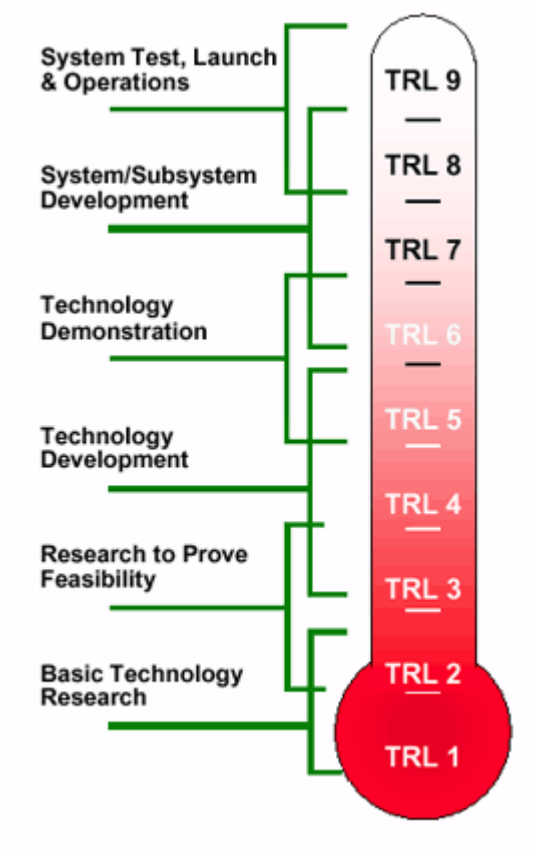


Figure 4. Technology Readiness Levels (TRL)

Level	Definition
TRL1	Basic principles observed
TRL2	Technology concept and/or application formulated
TRL3	Analytical and experimental critical function/proof-of-concept
TRL4	Component and/or breadboard validation in lab
TRL5	Component and/or breadboard in relevant environment
TRL6	System/subsystem model or prototype demonstration in relevant environment
TRL7	Subsystem prototype in a space environment
TRL8	System completed and flight qualified through demonstration
TRL9	System flight proven through mission operations

IV. Biomedical Data

Biomedical data are being collected in both the Longitudinal Study of Astronaut Health (LSAH) and the Life Sciences Data Archive (LSDA). These databases can be made available for research activities subject to scientific merit review, ethical issues related to the protection of subjects, and privacy issues. Identifiable human medical and research data are only available with the consent of the astronaut and/or research subject.

The LSAH is an electronic database of medical information collected over the active career and post-career life of the astronauts. Data are also available on a comparison group matched to the astronauts by age, sex, and initial body mass index. The data recorded include annual and flight-related medical evaluations, medical debriefs following space flights for astronauts, and routine annual medical evaluations for the comparison group.

V. Program Reporting

It is expected that results from funded research will be published in peer-reviewed journals as the work is completed. **Published papers must acknowledge NSBRI support.** In addition, investigators whose proposals are selected must also provide annual reports on progress in achieving the goals of the research project.

Annual Report
An Annual Report is due to the NSBRI 30 days before the end of the first year of funding to communicate the status of the completed research as well as peer-reviewed publications to date. A format outlining the report requirements will be provided. Submission of the first year annual report is required before the funding for the second year will be issued.

Final Report
A final report is required that shall include a summary of completed research and a record of all scientific communications, peer-reviewed publications, and intellectual property disclosures resulting from the NSBRI-supported work. This report must be submitted to the NSBRI within 60 days after the end of the Fellowship.

Annual and final reports shall emphasize the relevance of research results to the BR risks and questions as defined in Table 1 in the original proposal. It should be noted that the final report shall incorporate the results and relevance to Table 1 for the entire duration of the research project.

Follow-up
To assess the impact of Postdoctoral Fellowships on the career advancement of young scientists and to provide an active network of investigators in space biomedical research and development, the NSBRI will request brief, periodic updates on the status of NSBRI Fellows throughout their careers.

VI. Bibliography

1. **National Space Biomedical Research Institute Website.** http://www.nsbri.org/
   Contains information on the Institute's science, technology and education programs and detailed project summaries for all current and completed projects.

2. **NSBRI Team Strategic Plans.**
   Bone Loss**:** http://www.nsbri.org/Research/Bone.html
   Cardiovascular Alterations: http://www.nsbri.org/Research/Cardio.html
   Human Performance Factors: http://www.nsbri.org/Research/Sleep.html
   Immunology, Infection and Hematology: http://www.nsbri.org/Research/Immune.html
   Muscle Alterations and Atrophy: http://www.nsbri.org/Research/Muscle.html
   Neurobehavioral and Psychosocial Factors: http://www.nsbri.org/Research/Psycho.html
   Nutrition, Fitness and Rehabilitation: http://www.nsbri.org/Research/Nutrition.html
   Sensorimotor Adaptation: http://www.nsbri.org/Research/Neuro.html
   Smart Medical Systems: http://www.nsbri.org/Research/Med_Sys.html
   Technology Development: http://www.nsbri.org/Research/Tech.html

3. **Space Life Sciences Directorate Website.** http://slsd.jsc.nasa.gov/

4. **Exploration Systems Mission Directorate Interim Strategy.** Document available at: http://www.exploration.nasa.gov/documents/explor_strategy_hi.pdf

5. **NASA Vision for Space Exploration.** Document available at: http://www.nasa.gov/pdf/55584main_vision_space_exploration-hi-res.pdf

6. **NASA Task Book (Program Tasks and Bibliography).** The Living Task Book and Task Book Archives for FY1995-2003 are available at: http://peer1.nasaprs.com/peer_review/index.cfm

7. **Space Life Sciences Ground Facilities Information Package.** Document available at: http://research.hq.nasa.gov/code_u/nra/current/NRA-03-OBPR-04/GFIP-03-OBPR.pdf

8. **Space Life Sciences Data Archive (LSDA).** An online database containing descriptions and results of completed NASA-sponsored flight experiments. Descriptions are included of experiments, missions, procedures, hardware, biospecimens collected, personnel, and documents. Biospecimens that are available for research purposes are described in detail. A limited number of experiments contain final reports and spreadsheet data suitable for downloading. Data from human subjects are unavailable online for reasons of privacy. Internet address: http://lsda.jsc.nasa.gov/lsda_home.cfm

9. **Guidance for NASA Medical Board Procedures.** National Aeronautics and Space Administration, Medical Policy Board. Richard Williams, M.D., Chairperson. NASA Headquarters. This document is available at: http://peer1.nasaprs.com/peer_review/prog/mpbhand.pdf

10. **A Strategy for Research in Space Biology and Medicine in the New Century.** National Academy of Science. National Research Council Committee on Space Biology and Medicine. Mary J. Osborn, Committee Chairperson. 1998. Washington, DC. National Academy Press. http://www.nap.edu/books/0309060478/html/index.html

11. **Space Physiology and Medicine, 3rd ed.** A. Nicogossian, C. Huntoon, and S. Pool. (Eds.). 1994. Philadelphia, PA: Lea & Febiger.

12. **Task Force on Countermeasures.** This report incorporates the output of the Countermeasures Task Force, the Vestibular Countermeasures Task Group, and the Behavior and Performance Working Group into a unified document. This document is available at: http://peer1.nasaprs.com/peer_review/prog/countermeasures/countermeasures.html

13. **International Workshop on Cardiovascular Research in Space.** *Medicine and Science in Sports and Exercise*, Volume 28, Number 10 Supplement, 1996.

14. **Muscle Research in Space: International Workshop.** *International Journal of Sports Medicine*, Volume 18, Supplement 4, S257-S331, 1997.

15. **Space Neuroscience Research.** *Brain Research Reviews*, Volume 28, Numbers 1/2, Special Issue, 1998.

16. **International Workshop on Bone Research in Space.** *Bone, Official Journal of the International Bone and Mineral Society*, Volume 22, Number 5 (Supplement), 1999.

17. **Small Clinical Trials: Issues and Challenges.** Institute of Medicine, National Academy Press, Washington, DC. http://www.nap.edu/books/0309073332/html/

18. **Sex and Gender: Exploring the Biological Contributions to Human Health.** *NIH Guidelines on the Inclusion of Women and Minorities as Subjects in Clinical Research, 59 Fed. Reg. 14508 (1994).*

19. **Grant and Cooperative Agreement Handbook.** Office of Procurement, National Aeronautics and Space Administration, Washington, DC 20546

20. **Safe Passage, Astronaut Care for Exploration.** Institute of Medicine, National Academy Press, 2101 Constitution Avenue NW, Washington, DC 20418 (2001).

APPENDIX B
NSBRI-RFP-06-01

NSBRI Request for Proposals Soliciting Postdoctoral Fellowship Applications

Research Projects for Postdoctoral Fellowships as a Part of a Research Team of the National Space Biomedical Research Institute

NOTE 1: The program is open to U.S. citizens, permanent residents, or persons with pre-existing visas obtained through their sponsoring institutions that permit postdoctoral training for the project's duration. To be eligible for this program, applicants may not have more than three years of previous postdoctoral training.

NOTE 2: The overall focus for NSBRI proposals should be the definition and feasibility of specific practical countermeasures (CRL 3-7).

I. Introduction

The NSBRI is a nonprofit organization competitively selected by NASA. The mission of the Institute is to use an integrated research team approach to advance biomedical research with the goal of ensuring safe and productive long-term human exploration of space. The NSBRI invites ground-based research applications to join an existing team in one of the following research areas:

1. *Bone Loss* – Addressing bone loss and weakening during space flight, and the inherent fracture risks.
2. *Cardiovascular Alterations* – Addressing the inflight occurrence of cardiac dysrhythmias and postflight impairment of the cardiovascular response to orthostatic and exercise stress.
3. *Human Performance Factors, Sleep and Chronobiology* – Investigating maintenance of high cognitive performance and vigilance despite environmental stress and sleep disturbances.
4. *Immunology, Infection and Hematology* – Addressing immune system impairment and altered susceptibility to infection, increased allergic responsiveness, decreased blood volume and postflight anemia.
5. *Muscle Alterations and Atrophy* – Focusing on the loss of skeletal muscle mass, strength and endurance that accompanies space flight.
6. *Neurobehavioral and Psychosocial Factors* – Investigating methods and tools that can be utilized to enable crews to cope with stress, isolation and compatibility.
7. *Nutrition, Physical Fitness and Rehabilitation* – Developing methods to maintain health and fitness before, during and after space flights.
8. *Sensorimotor Adaptation* – Addressing the problems of space motion sickness and disorientation during flight and the postflight problems of balance and gaze disorders

9. *Smart Medical Systems* – Developing new methods of non-invasive medical monitoring, diagnosis and therapy for use on space missions.
10. *Technology Development* – Developing instrumentation and other technological products that will enhance the research of the other teams and benefit people on Earth.

Each of the research teams consists of a set of coordinated and complementary projects focused on a common theme. In addition, applications which address space radiation are encouraged, as a cross-cutting discipline relevant to human research in the areas described above. Team management and coordination is the responsibility of the **Team Leader**. A Team Leader, assisted by an Associate Team Leader, heads each research team. Team Leaders play a pivotal role in guiding the Institute's research program and in the ultimate success of the Institute. Their expertise and "hands-on" approach to research management add value across projects and across teams. The Team Leader is guided by the Bioastronautics Roadmap (BR), which is the cornerstone for developing the team's integrated strategic research plan, the key to accomplishing the Institute's mission.

Research proposals will be accepted from all categories of organizations, public and private, and for profit and nonprofit, such as universities, colleges, hospitals, laboratories, units of state and local governments, and eligible agencies of the Federal Government. The mechanism of support shall be an NSBRI sub-agreement with funds provided by NASA through a cooperative agreement (Cooperative Agreement NCC 9-58) with NASA's Lyndon B. Johnson Space Center. Progress of the funded research is reviewed annually.

II. Background

The NSBRI is responsible for the development of countermeasures and risk-mitigation strategies to alleviate the deleterious effects of long-duration space flight and the support of applied space biomedical research directed toward this specific goal. Its mission is to lead a national effort in integrated, critical path space biomedical research that supports NASA's Vision for Space Exploration by focusing on the enabling of long-term human presence in, development of, and exploration of space. This is accomplished by:

- designing and testing effective countermeasures to address the biological and environmental impediments to long-term human space flight;
- defining the molecular, cellular, organ-level, and integrated responses and mechanistic relationships that ultimately determine these impediments, where such activity is essential for the development of novel countermeasures;
- establishing biomedical support technologies to maximize human performance in space, reducing biomedical hazards to an acceptable level, and delivering quality medical care;
- transferring and disseminating the biomedical advances in knowledge and technology to the general benefit of mankind; and
- ensuring open involvement of a diverse scientific community, industry, and the public at large in the Institute's activities and fostering a robust partnership with NASA, particularly through NASA's Lyndon B. Johnson Space Center.

Institute Infrastructure

The NSBRI is governed by a consortium of twelve institutions: Baylor College of Medicine; Brookhaven National Laboratory; Harvard Medical School; The Johns Hopkins University School of Medicine and Applied Physics Laboratory; Massachusetts Institute of Technology; Morehouse School of Medicine; Mount Sinai School of Medicine; Rice University; Texas A&M University; the University of Arkansas for Medical Sciences; the University of Pennsylvania Health System; and the University of Washington. The Institute's Headquarters are located in Houston, at Baylor College of Medicine.

This is an open solicitation. Consortium membership <u>is not a requirement</u> for Postdoctoral Fellowship Program participation. An independent Board of Scientific Counselors (BSC) is responsible for assuring excellence in the Institute's research program through independent external peer review. An External Advisory Council (EAC) is responsible for advising Institute Management and the Board of Directors (comprised of, but not limited to, representatives from the senior management of each of the 12 NSBRI Consortium member institutions) concerning program strategy, tactical implementation, and effectiveness. The NSBRI also has a User Panel of former and current astronauts and flight surgeons responsible for assuring that the research program is focused squarely on astronaut health and safety. An Industry Forum of representatives from the space and biomedically-related industries advises and assists the NSBRI concerning Earth- and space-based applications for Institute research. In addition to its research program, the NSBRI has developed a vital education and outreach program that takes advantage of the Institute's core research activities. The Institute coordinates its research activities with NASA through a joint NASA/NSBRI Steering Committee and other NASA/NSBRI strategic and tactical working groups.

III. Specific Research Focus and Opportunity

General Information

To carry out the NSBRI's primary mission of identifying, designing and developing effective countermeasures to address the biological and environmental impediments to human space flight, the NSBRI focuses its research program on the primary needs of long-duration missions (e.g., several months on the International Space Station and exploration class missions to the moon and Mars). These missions pose the greatest challenge to present and future space travelers, and meeting these challenges with appropriate countermeasures lies at the core of the NSBRI's responsibility.

Potential physiological changes that may occur during prolonged space flight include, among others, significant loss of muscle and bone mass, decreased dietary intake of nutrients, metabolic and endocrine alterations, important changes in cardiovascular function, and deleterious effects on sensorimotor performance. By addressing long-term missions, increased crew safety, health, and performance will be realized for shorter-duration space flights.

NSBRI research is conducted in partnership with NASA using an **integrated team approach**. The teams focus on high-priority biomedical research problems and investigators work together, within and between teams, to address complex risks that often require interdisciplinary expertise and resources. The value added in the integrated team approach leads to more effective outcome-driven research than what is obtainable by a single project alone.

The NSBRI has an essential enabling role for NASA: providing capabilities for countermeasures development research. The Institute engages scientists, engineers, and clinicians and utilizes the resources of institutions to form a biomedical research community. Countermeasures research conducted by the NSBRI integrates a biomedical research community with the engineering and operational expertise of NASA to effectively manage health risks for long-duration human space flight.

The NSBRI's research program contains studies that, for the most part, range from CRL 3 through 7. Each applicant must examine and understand the CRL scale and specify in the proposal the CRL that will result from the funding and conduct of the proposed research. For further information, refer to Appendix A.

NSBRI Team-Specific Research Focus and Opportunity

Applications submitted to the NSBRI in response to this NSBRI-RFP must address one of the research areas discussed below. Proposals that impact more than one area should be directed to only one primary research area. Studies that use integrated methods are particularly encouraged.

It is recommended that investigators carefully review the Team Strategic Plan of the team(s) relevant to a proposal. These plans are referenced in the following subsections, which are meant to guide the investigator to the key problems and issues that are central to each research area. In all cases, proposals must represent questions and be relevant to priorities enumerated in the BR at http://bioastroroadmap.nasa.gov/index.jsp.

Proposals in radiation, modeling, space medicine and technology that are relevant to countermeasure development within the scope of the NSBRI mission are invited but must address one of the research areas discussed below. The NSBRI seeks innovative projects of two years in duration and of varying scope that will produce clear deliverables. Applicants are encouraged to define clear milestones and to collaborate with NASA scientists, engineers, flight surgeons, and astronauts, as appropriate, to maximize the likelihood of success and impact of their proposed research.

1. NSBRI Bone Loss Team

The Bone Loss Team studies the mechanisms involved in bone loss related to microgravity, the development of countermeasures to prevent bone loss, and methods for evaluating the rate of loss and the impact on fracture risk. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Bone.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- What pharmacological, nutritional, or mechanical treatments, or combinations thereof, effectively diminish the loss of bone mass in weightless or non-weight bearing conditions that simulate microgravity? Investigation of this question may require chronic bed rest studies.
- Which factors (genetic, baseline values, fitness, etc.) determine the wide variation in inter-individual rates and site-specific patterns of bone loss?
- Which radiological or imaging methods best permit geometric or structural analysis of patterns and rates of bone loss in humans subjected to microgravity?
- Is there a means of accelerating the recovery of bone following exposure to weightlessness? Does the delayed return of bone mass to preflight levels increase injury risk during rehabilitation? If so, how can bone recovery be accelerated?
- What is the nature and incidence rate of soft connective tissue injury and related symptoms during and after prolonged space flight?
- Can one quantify the incidence or extent of injury to intervertebral discs during weightlessness or upon return to normal gravity?
- Which procedures will protect against soft tissue injury in flight and hasten repair of damaged soft tissues?
- Can alterations in the timing and consolidation of fracture callus that forms during disuse/ microgravity be normalized, and with what pharmacological or mechanical interventions?
- What modalities are practical for space flight applications that might accelerate fracture healing?
- Can fracture risk be accurately predicted from novel modeling techniques developed from available bone loss data collected on astronauts/cosmonauts?
- The development of novel nutritional and pharmacological countermeasures to reduce renal stone formation.

2. NSBRI Cardiovascular Alterations Team

The Cardiovascular Alterations Team is focused on understanding the mechanisms of, and identifying effective solutions to, conditions wherein astronauts may experience heart rhythm disturbances, cardiac atrophy, and a drop in blood pressure, causing faintness, reduced exercise capacity, and decreased function following landing. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Cardio.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- Countermeasures to reduce impaired cardiovascular responses to orthostatic stress.
- Occurrence of serious cardiac dysrhythmias and methods to predict and prevent such events.
- Cardiac atrophy and remodeling.
- Techniques to address the manifestation of previously asymptomatic cardiovascular disease that may present during space missions.
- Impaired cardiovascular response to exercise stress.
- Development of new cardiovascular technologies for space flight and Earth-based applications.
- Individual susceptibility to the adverse effects of space flight on the cardiovascular

system.
- Strategies for short-term and long-term cardiovascular rehabilitation following space flight.

3. NSBRI Human Performance Factors, Sleep and Chronobiology Team

The Human Performance Factors, Sleep and Chronobiology Team is developing ways to reduce human mistakes and optimize mental and physical performance during long-duration space flight. The loss of 24-hour day/light cycle, weightlessness, a confined environment, and work demands make sleep difficult in space. Cumulative sleep loss increases the risk of accidents and possible mission failure. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Sleep.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- Which photic, behavioral, environmental, pharmacological, nutritional, and/or exercise countermeasures will help crew members reduce disturbances of circadian rhythmicity, sleep disturbances, or homeostatic sleep drive, thereby reducing the associated performance deficits?
- How can performance during prolonged space flight be optimized by manipulating the neurobiological processes underlying sleep and/or circadian rhythmicity?
- What are the most sensitive and specific methods for monitoring the ongoing status of sleep, sleep homeostasis, circadian regulation, individual light exposure, performance capability, metabolic functions, and physical health during extended-duration space flight?
- What are the best optimization techniques for using mathematical models of sleep homeostasis and circadian regulation to specify and schedule countermeasure strategies?
- What measures of sleep, sleep disorders, or circadian function predict individual neurobehavioral performance, adaptation, metabolic function, physical health, or countermeasure efficacy?
- What are the effects of space flight on the pharmacokinetics, efficacy, side effects, and interactions (drug-drug, drug-sleep, drug-circadian) of therapeutic agents designed to improve sleep, circadian regulation, cognitive performance, and physical health?
- What technological and procedural advances can minimize the probability of error by astronauts whose abilities may be impaired by fatigue or circadian disruption?
- How can advances in computer-aided decision making, on-board training, or smart check lists be applied to offset cognitive deficits?
- How can recent advances in the neurobiology of sleep and/or circadian rhythms (e.g., orexin/hypocretin system, circadian photoreception, output pathways for regulation of sleep or circadian rhythms, peripheral oscillators) be used to develop countermeasures to facilitate adaptation to the space environment and thereby maintain optimal neurobehavioral performance during an exploration-class space mission?
- How do countermeasures intended for other physiologic systems (e.g., exercise, activity schedules) interact with sleep, circadian organization, and waking function in long-duration space flight? How might the timing of such countermeasure administration be used to improve sleep, circadian organization, waking performance, or physical health?

4. NSBRI Immunology, Infection and Hematology Team

The Immunology, Infection and Hematology Team is examining the effects that extended space flight might have on a weakened immune system which may contribute to enhanced susceptibility to infection and virus reactivation. Radiation damage to bone marrow stem cells raises concern of space flight-related anemia and other blood cell deficiencies following a mission. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Immune.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- Effect of space environmental conditions on long-term risks of viral-induced malignancies.
- Countermeasures to address radiation effects on host control of infection: mucosal vs. systemic immunity.
- Effects of microgravity and/or radiation on virulence of microbes and on the host-microorganism homeostasis.
- Assessment of space radiation effects on bone marrow.
- Therapeutic role of pluripotent stem cells and hematopoietic progenitor cells in mitigation of deleterious effects of space radiation on immune function.
- Effects of space radiation on lymphocyte function.
- Mechanisms of transmission of microbial agents in space flight conditions.
- Development of monitoring systems for microorganisms and virus reactivation.
- Stem cell reconstitution using an irradiated mouse model.
- Countermeasures to increase resistance to infections and malignancies in space: role of nutritional supplements, hormones, antibodies, pharmaceuticals, and vaccines.
- Use of molecular-based approaches to facilitate resistance to radiation-induced pathogens.

5. NSBRI Muscle Alterations and Atrophy Team

The Muscle Alterations and Atrophy Team's objective is to develop methods to prevent or reduce muscle loss on space missions. While astronauts exercise in space, current exercise regimens alone are not sufficient to prevent potentially deleterious changes that occur in skeletal muscle during space flight. The Team works to identify effective physical countermeasures (i.e., exercise prescriptions) and to combine this strategy with other countermeasures, such as improved nutrition and pharmacological interventions. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Muscle.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- Effects of resistance training as a countermeasure to muscle alterations and atrophy in simulated microgravity (e.g. altered loading states).
- Are there synergistic effects when various activity paradigms are carried out simultaneously with other countermeasures, such as nutritional modification and/or

pharmacological intervention and other strategies, such as antioxidants and vitamin supplements?
- Is it necessary to maintain or regain muscle mass in order to maintain muscle strength and power generating capacity?
- Are there practical programs predicated on activity paradigms that can maintain the normal phenotypes typically seen in the muscles of humans and animals?
- How do altered loading states impact the sensorimotor processes that affect posture, balance, and the performance of locomotor tasks of varying intensity and complexity?
- What are the stress/strain reactions that impact force production, and do muscle atrophy and injury processes affect these properties?
- Are atrophying skeletal muscle, the myotendinous junctions, tendons, and ligaments more prone to injury and are the mechanisms of recovery from injury altered by unloading?
- How does artificial gravity (e.g., gravity-equivalent acceleration and variable-G forces) affect the structure and function of human skeletal muscle in normal and atrophying skeletal muscle?
- Are there systems other than skeletal muscle that are impacted by artificial gravity?
- Can artificial gravity approaches interact with other paradigms impacting high stress levels on the musculoskeletal system?

6. NSBRI Neurobehavioral and Psychosocial Factors Team

The Neurobehavioral and Psychosocial Factors Team is concerned with methods crews use to deal with stress, isolation, confinement, and the challenges of long-duration space missions. In addition to identifying neurobehavioral and psychosocial risks to crew health, safety, and productivity, Team objectives include developing methods to monitor brain function and behavior and countermeasures to enhance performance, motivation, and quality of life. Leadership style, crew composition, organization, and communication are also being investigated to optimize crew effectiveness and mission success. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Psycho.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- What are the effects of culture, gender, personality, leadership, and training on performance, stress, and health in isolated groups in confined environments and ground-based, analog environments for space flight?
- What are the major influences on interpersonal actions, communications, and problem solving in small isolated groups, and what techniques can be developed to optimize group dynamics and performance?
- How can affective, neurobehavioral, and neurocognitive dysfunction be objectively detected in remote locations?
- What objective, unobtrusive methods and approaches will permit detection of stress, declining cognitive, emotional, and social functions, and changes in operationally-relevant performance capabilities during space flight?
- What are the effects of space radiation on cognitive and other brain functions, and what countermeasure strategies should be developed to minimize the potential harmful central nervous system effects of radiation exposure?

- What neurobiological processes of stress and arousal are the optimal targets for behavioral and pharmacological interventions?
- What behavioral and pharmacological interventions are optimal in space flight?
- What are the effects of long-term exposure to the major factors in the space environment on emotions (including emotional reactivity, stress neurobiology and responses, modulation of mood, and vulnerability to affective disorders), cognition and performance (including processes of sensation and perception, learning, vigilance, problem solving, decision making, and motor skills), and behavioral health?
- What are the behavioral strategies, scheduling and timeline approaches, and habitability design elements that can maintain or enhance crew performance and prevent the development of hostility within flight crews and between crews and ground-support personnel during long-duration space flight?
- How can mathematical models of human interaction and the temporal dynamics of human behavior help predict responses in space flight?

7. NSBRI Nutrition, Physical Fitness and Rehabilitation Team

The Nutrition, Physical Fitness and Rehabilitation Team is addressing the quality and quantity of dietary intake, exercise, and rehabilitation to reduce or eliminate muscle atrophy and bone loss, and to improve altered cardiovascular function. The Team is also examining countermeasures to reduce the biomedical risks of radiation, circadian alterations, and other factors associated with long-duration human space missions. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Nutrition.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- Understanding mechanisms and designing effective nutritional countermeasures to the deficiencies in thirst and nutrient intake, with relevance to changes that may occur during human space flight.
- Establishing ground-based clinical measurements of biochemical alterations that may indicate depression of food intake.
- Developing monitoring methods for assessment of food intake and physical activity that are relevant to the space environment.
- Nutrition and/or physical fitness countermeasures to high-priority problems, with emphasis on radiation-enhanced carcinogenesis, depression of cognitive function, bone loss, and loss of muscle mass and function.
- Studies that assess the effectiveness of aerobic and resistive exercise countermeasures, with endpoint parameters that quantify the cardiovascular response, bone metabolism, body composition, and skeletal muscle metabolism and function.
- Assessment of exercise countermeasures that include strict dietary control and contain measures of energy balance.
- Development of accurate methods to assess body composition changes relevant to human space flight.

8. NSBRI Sensorimotor Adaptation Team

The Sensorimotor Adaptation Team is developing potential preflight and inflight countermeasures to allow crew members to adjust more rapidly to gravitational changes that can result in disorientation, motion sickness and a loss of sense of direction. These problems have an impact on space motion sickness, landing and postflight adaptation. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Neuro.html.

Proposals are sought whose research addresses, but is not limited to, the following areas and questions:

- What causes the profound impairments of posture, gaze, visual acuity, ataxia, and locomotion stability in astronauts, and what countermeasures minimize these impairments to reduce re-entry and landing vertigo, acute space motion sickness, postflight imbalance, and inflight spatial disorientation?
- Are some crew members more susceptible to re-entry and landing vertigo than others, and does repeated microgravity experience confer significant immunity?
- Can new, safe, and effective anti-motion sickness drugs be developed which specifically target emetic centers or the vestibular-emetic linkage, act rapidly, and do not impair cognition or performance?
- Can improved anti-motion sickness delivery systems and dose and side-effect monitoring systems be developed, and what are the best ground-based methods for assessing the effectiveness and side effects of drug countermeasures and for evaluating microgravity pharmacokinetics?
- Are there non-pharmacologic techniques (e.g., parabolic flight pre-adaptation, head movement restriction) which could significantly reduce the incidence of acute space motion sickness, or which could mitigate the impact of emesis on extravehicular activity life support systems?
- What is the effect of cardiovascular, muscle, and skeletal rehabilitation therapies on neurovestibular recovery, and the converse?
- Can preflight or inflight training, balance exercises, sensory aids, prostheses, and assessment techniques improve postlanding postural and locomotor control and functional task performance?
- What spacecraft architectures and interior visual cues minimize disorientation?
- What are the effects of artificial gravity on human orientation and eye, head, and limb movements, and what are the pros and cons of various types of artificial gravity as countermeasures against the effects of microgravity on neurovestibular function?
- Does long-term exposure to microgravity or partial gravity, radiation, or environmental toxins cause functionally important, irreversible (pathophysiological) changes in central or peripheral vestibular and sensorimotor function, development, or plasticity, or cause acceleration of the normal aging process?
- Does microgravity-altered calcium homeostasis impact otoconial formation, and if there are important effects, what countermeasures are appropriate?

9. NSBRI Smart Medical Systems Team

The Smart Medical Systems Team is developing and applying new technologies for physiological and medical monitoring and clinical care that integrate novel hardware, intelligent

algorithms and models, and new therapeutic approaches applicable for remote health care in the space environment and on Earth. The Team works closely with the Technology Development Team and the Space Medicine group at Johnson Space Center. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Med_Sys.html.

Proposals are sought whose research addresses, but is not limited to, the following areas:

- Novel sensor systems for remote physiological monitoring and medical diagnosis.
- Novel diagnostic and therapeutic hardware modalities to reduce risk and problems associated with trauma and acute medical conditions that might occur in the space environment.
- Innovative imaging strategies with automated, intelligent diagnostic interpretation capabilities.
- Methods to reduce risk of and manage toxic exposure in a space environment.
- Methods to better understand and reduce risk of altered pharmacodynamics, adverse drug reactions, and drug interactions.
- Decision support systems and knowledge bases for diagnosis and treatment that interface humans and machines, and enhance clinical care and medical training for crew medical officers and flight surgeons.

10. NSBRI Technology Development Team

The Technology Development Team develops new devices and systems to improve research techniques for the other teams, and adds value to the enabling scientific and medical technologies already supported by the other teams and by NASA. Projects focus on designing lightweight, compact research tools and on developing simple, minimally-invasive and non-invasive methods of gathering health-related data that are relevant to space missions and have Earth-based applications. Team information and the Team Strategic Plan for countermeasures research and development, including research goals and priorities, are located at http://www.nsbri.org/Research/Tech.html

Proposals are sought whose research addresses, but is not limited to, the following areas:

- Development of multi-purpose instruments or devices to monitor physiological measures (e.g., vital signs, core body temperature, eye motion, body fluid chemistry) using sensors and sensor systems that are easy to use, non-invasive (or minimally-invasive), comfortable to wear, unobtrusive, and non-interfering with task performance.
- Innovative technologies applicable to the space environment to detect and identify pathogens (including bacteria, fungi, and viruses) in air, water samples, food, and human specimens, utilizing small sample volumes, fast read-out, and automated methods.
- Development of automated approaches to carrying out biochemical assays (especially in flight) with minimal operator intervention.
- Development of novel devices to collect blood and other bodily fluids with minimum crew disturbance and discomfort.
- Advanced cabin communications and information management systems, including wireless and infrared optical systems, to facilitate the collection and analysis of important biological information without tethering or otherwise hampering astronaut activities.

- Low mass, compact diagnostic and therapeutic tools and equipment that use minimum spacecraft resources and augment the efforts of the NSBRI Smart Medical Systems Team and NASA Space Medicine to enrich the inflight clinical status evaluation of crews.

IV. Application Procedures for the NSBRI Postdoctoral Fellowship Program

Applications for Postdoctoral Fellowships to join an NSBRI research team must comply with the requirements of this research opportunity as described in this appendix (Appendix B). Appendix C outlines general NSBRI-specified requirements for proposal submission and should be used only for clarification of matters not specifically discussed here. Appendix B supersedes, modifies, or extends the requirements enumerated in Appendix C.

General Instructions

Postdoctoral Fellowship Applications must be submitted through NSBRI's Internet-based Electronic Proposal Submission System (EPSS).

EPSS has been designed to enable the Postdoctoral Fellowship Applicant and Postdoctoral Fellowship Mentor to collaborate on the development of an application, to retain complete privacy throughout the application development process, and to allow fast and accurate application submission. If an application is selected for funding, the electronic proposal information will serve as an active record file, enabling simplified investigator information changes and annual report submission.

A Letter of Intent must be prepared and electronically submitted through EPSS. To facilitate planning for the review process, applicants are requested to submit a letter of intent using EPSS and following the online instructions. To assure the Letter of Intent is submitted by **June 22, 2006**, go to the website http://myportal.nsbri.org/ to request a personal account on the system. After entering contact information, investigators will receive via email a username and password for entry into EPSS. **Applicants should begin creating a new Postdoctoral Fellowship Application.** After entering a proposal title, selecting the appropriate team (both of which can be changed at a later date prior to submission) and selecting the appropriate NSBRI-RFP, they will be prompted to enter the limited information required for a Letter of Intent. After this, the above web address will serve as the entry point for proposal development and modification. All information entered, with the exception of that required for the Letter of Intent, will remain private until electronic submission is completed. **Please note that Letters of Intent are requested, but not required for submission of a Postdoctoral Fellowship Application. Failure to submit a Letter of Intent will not impact the selection process. Letters of Intent cannot be submitted after the deadline stated in this NSBRI-RFP.**

Proposal information requested in EPSS closely follows the information requested by NIH grant application form PHS 398. This information includes Personnel and Institutional Information, Project Description, Performance Sites, Biographical Sketches and Other Support for both the applicant and mentor, Laboratory Resources, and Research Plan.

An application overview screen will guide applicants through the process of completing the required application information. EPSS offers a collaborative work environment for the Postdoctoral Fellowship Applicant and Mentor to view and submit various portions of the

application. For example, the Applicant can enter or upload all information for the proposal. The Mentor can view all of the application information but is permitted to enter only their specific personal information (Biography and Other Support) and the Support Statement of Mentor. All investigators can allow an administrative support person to act on their behalf, to assist in the entry of application information; however, electronic submission can only be performed by the Postdoctoral Fellowship Applicant. EPSS will contain an Investigator Profile section, containing biographical sketches and other information, for each investigator registered in the system. This information can be used by authorized proposing investigators, eliminating the duplicate entry of such information.

Electronic proposals and applications must be submitted before 5:00 p.m. ET, Thursday, July 20, 2006. After submission using EPSS, the Postdoctoral Fellowship Applicant **must** mail the printed application cover page that is generated by the system, with the appropriate institutional and mentor signature approvals. The cover page must be received within **one week** of the submission deadline at the following address:

National Space Biomedical Research Institute
RE: Postdoctoral Fellowships
One Baylor Plaza, NA-425
Houston, TX 77030-3498
713-798-7412

Three letters of reference for Postdoctoral Fellowship Applicants must be received at the address above within one week following the submission deadline. Postdoctoral Fellowship Applicants will be notified via email when each letter of reference is received by NSBRI. **Applications without all three required letters received within one week of the submission due date will be considered incomplete and may be returned to the applicant without review.**

Please direct any questions concerning this application procedure to NSBRI by calling 713-798-7412, faxing questions to 713-798-7413, or sending an inquiry to contact_us@www.nsbri.org. The technical requirements to operate EPSS are Internet Explorer 4.0+ or Netscape 4.03+ for Windows, Macintosh, or Unix. EPSS is best viewed using Internet Explorer 6.0.

Eligibility – All categories of institutions are eligible to submit proposals in response to this NSBRI-RFP, but, in most cases, only approved applications from U.S. institutions will be selected for funding. Postdoctoral Fellowship Applicants may collaborate with universities, Federal Government laboratories, the private sector, and state and local government laboratories. In all such arrangements, the applying entity is expected to be responsible for administering the project according to the management approach presented in the proposal.

The applying entity must have in place a documented base of ongoing high quality research in science and technology or in those areas of science and engineering clearly relevant to the specific programmatic objectives and research emphases indicated in this Request for Proposals. Present or prior support by NASA or the NSBRI of research or training in any institution or for any investigator is neither a prerequisite to submission of an application nor a competing factor in the selection process.

Special Matters – (specific information on animal or human subjects protocol approval required, if applicable).

For proposals employing human subjects and/or animals, assurance of compliance with human subjects and/or animal care and use provisions is required on the Proposal Cover Page. In addition, the application must include a statement from the applicant institution certifying that the proposed work will meet all Federal and local requirements for human subjects and/or animal care and use.

Policies for the protection of human subjects in NASA sponsored research projects are described in the NASA Policy Directive (NPD) 7100.8D "*Protection of Human Research Subjects:"*
http://nodis.hq.nasa.gov/displayDir.cfm?Internal_ID=N_PD_7100_008D_&page_name=main&search_term=7100%2E8D%20
Animal use and care requirements are described in the NASA Code of Federal Regulations (CFR) 1232 (*Care and Use of Animals in the Conduct of NASA Activities*):
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=2184a825efdce39c35bde4673d5d8158&rgn=div5&view=text&node=14:5.0.1.1.22&idno=14

Additional Requirements for Research Employing Human Subjects

A letter signed by the Chair of the Institutional Review Board (IRB) identifying the proposal submitted to the NSBRI by title and certifying approval of proposed human subjects protocols and procedures should be included in the appendix of the proposal. IRB certifications for other research proposals or grants cannot be substituted (even if they employ the same protocols and procedures).

If IRB certification is pending on the proposal due date, select "pending" from the IRB/IACUC section menu on the Proposal Cover Page, and include in the appendix of the proposal a letter signed by the IRB Chair identifying the proposal by title and indicating the status of the IRB review process at the time of submission. IRB certification must be received no later than 90 days after the proposal due date. An application lacking the required IRB certification 90 days after the proposal due date will be considered incomplete and may be returned to the applicant without review.

With regard to research involving human subjects, NASA and the NSBRI have adopted the National Institutes of Health (NIH) policy. Women and members of minority groups and their subpopulations must be included in NASA-supported biomedical and behavioral research projects involving human subjects, unless a clear and compelling rationale and justification is provided showing that inclusion of these groups is inappropriate with respect to the health of the subjects or the purpose of the research.

The NSBRI will require current IRB certification prior to each year's award.

Additional Requirements for Research Employing Animals

Specific information describing and justifying the use of animal subjects must be included in the proposal.

A letter signed by the Chair of the Institutional Animal Care and Use Committee (IACUC) identifying the proposal submitted to NBSRI by title and certifying approval of the proposed animal research protocols and procedures should be included in the appendix of the proposal. The institution's Public Health Service Animal Welfare Assurance Number must be included on the IACUC certification and entered in the IRB/IACUC section of the Proposal Cover Page. IACUC certifications for other research proposals or grants cannot be substituted (even if they employ the same protocols and procedures).

If IACUC certification is pending on the proposal due date, select "pending" from the IRB/IACUC selection menu on the Proposal Cover Page, and include in the appendix of the proposal a letter signed by the IACUC Chair identifying the proposal by title and indicating the status of the IACUC review process at the time of submission. IACUC certification must be received no later than 90 days after the proposal due date. An application lacking the required IACUC certification 90 days after the proposal due date will be considered incomplete and may be returned to the applicant without review.

NSBRI will require current IACUC certification prior to each year's award.

Duration of Proposed Research – Proposals may be submitted for a duration of two years and an assumed start date of October 1, 2006. This date is flexible, however, and will be negotiated with each selected Fellow individually.

Special Ground Facilities – A variety of special ground research capabilities, including centrifuge facilities, bed rest facilities, etc., are available for use by investigators submitting proposals in response to this NSBRI-RFP. Interested investigators are referred to the *Space Life Sciences Ground Facilities Information Package* for instructions on how to incorporate the use of these facilities into a proposal.

Special Travel and Reporting Requirements – Postdoctoral Fellows selected in response to this NSBRI-RFP will be expected to attend two research team meetings per annum as well as one general investigator workshop or retreat per year in the Houston area. Funding, as available, will be provided to cover the costs associated with these meetings. Fellows selected will become part of the NSBRI's research program and will be expected to provide an annual and final progress report. Progress is reviewed annually.

Data Management Plan – Fellows should plan to supply data from their studies to an NSBRI/NASA **bioinformatics initiative** within the two-year time frame of the fellowship. If selected, a data management plan, including a list of the data products and an anticipated schedule for their delivery, must be prepared and submitted to NSBRI.

Additional Guidelines Applicable to Foreign Applicants – The program is open to U.S. citizens, permanent residents, or persons with pre-existing visas obtained through their sponsoring institutions that permit postdoctoral training for the project's duration. To be eligible for this program, applicants may not have more than three years of previous postdoctoral training. All proposals must be in English and comply with all other submission requirements stated in the NSBRI-RFP.

V. Review and Selection Process

Upon receipt, applications will be reviewed for compliance with the requirements of this Request for Proposals. This includes the following:

1. Submission of complete applications as specified in this Request for Proposals. Proposals must be responsive to the areas of program element emphasis described in this NSBRI-RFP and include a research plan that is **not more than 10 pages in length**.
2. Submission, as specified in Appendix B, of appropriate Institutional Review Board (IRB) and/or Institutional Animal Care and Use Committee (IACUC) certification for all proposals using human or animal test subjects.
3. Submission of all other appropriate forms, letters and institutional and mentor signatures as required by this NSBRI-RFP.

Note: Non-compliant applications will be withdrawn from the review process and returned to the applicant without further review.

Compliant applications submitted in response to this NSBRI-RFP will undergo an intrinsic scientific or technical merit review by a peer-review panel.

Criteria for Evaluation of Applications

Applications will be evaluated on the basis of three criteria: (i) scientific merit and program relevance of the proposal, (ii) research mentor and training environment, and (iii) research background and qualifications of the candidate. Final selections for funding of proposals will be made by the NSBRI Director. Applicants are encouraged to review detailed project summaries for current and completed NSBRI research projects at http://www.nsbri.org. The technical summaries appear in the "Research Areas" section.

Development of a Selection Recommendation

A selection recommendation will be developed based on the criteria as described above. **Deficiencies in any of the criteria factors may prevent selection of an application.** The development of selection recommendations is the responsibility of the peer-review panel. Final selections for funding of proposals will be made by the NSBRI Director. Only grants will be awarded as a result of this NSBRI-RFP.

APPENDIX C
NSBRI-RFP-06-01

INSTRUCTIONS FOR RESPONDING TO NSBRI REQUESTS FOR PROPOSALS

(a) General.

(1) Proposals received in response to an NSBRI Request for Proposals (NSBRI-RFP) will be used only for evaluation purposes. The NSBRI does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NSBRI-RFP to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in an NSBRI award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that the NSBRI and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NSBRI-RFPs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NSBRI-RFPs.

(4) A cooperative subagreement will be used to accomplish an effort funded in response to an NSBRI-RFP. The NSBRI will coordinate the implementation of the award instrument. Contracts resulting from NSBRI-RFPs are subject to the Federal Acquisition Regulation (FAR) and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) The NSBRI has a mandatory format for responses to NSBRI-RFPs. All applications must be submitted utilizing the NSBRI's Electronic Proposal Submission System (EPSS). For further information, please see Appendix B, Section IV.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NSBRI-RFP; contain sufficient technical information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA or NSBRI solicitation.

(b) NSBRI-RFP-Specific Items. Several proposal submission items appear in the NSBRI-RFP itself: the unique NSBRI-RFP identifier; dates for proposal deadlines; addresses for submission of proposals (both hard copy and electronic forms); electronic submission format; and sources for more information. Items included in these instructions may be supplemented by the NSBRI-RFP.

(c) The following information is needed to permit consideration in an objective manner. NSBRI-RFPs will generally specify topics for which additional information or greater detail is desirable.

(1) **Proposal Cover Page**

(i) The legal name of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, small business, woman-owned, socially and economically disadvantaged, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of the NSBRI-RFP, by number and title, to which the proposer is responding;

(vi) Desired starting date, and duration of project;

(vii) Date of submission;

(viii) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself); and

(ix) Signature of a mentor for Postdoctoral Fellowship Applications.

(2) **Restriction on Use and Disclosure of Proposal Information.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice at the beginning of the Research Plan (which is in addition to the specified page limits) and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but the NSBRI assumes no liability for use and disclosure of information not made subject to the notice.

Notice
Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged ("Information"). It is furnished to the NSBRI in confidence with the understanding that it will not, without permission of the Offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this Information to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this Information if obtained from another source without restriction. The obligations in this Section shall not apply with respect to any Information which:

(a) is disclosed in a printed publication available to the public, is described in a patent anywhere in the world, is otherwise in the public domain at the time of disclosure, or becomes publicly known through no wrongful act on the part of NSBRI;

(b) is known to NSBRI or becomes known to NSBRI through disclosure by sources other than the Offeror having the right to disclose such Information;

(c) is disclosed pursuant to the requirement of a governmental agency or any law requiring disclosure thereof;

(d) is generally disclosed to third parties by the Offeror without similar restriction on such third parties; or

(e) is approved for release by written authorization of the Offeror.

(3) **Abstract.** Include a concise 2,500 character abstract describing the objective and the method of approach.

(4) **Project Description.** The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NSBRI-RFP. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(5) **Personnel.** The applicant is responsible for supervision of the work. A short biographical sketch of the Postdoctoral Fellowship Applicant, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information for the mentor who will be directly associated with the project.

(6) **Facilities and Equipment.** Describe available facilities and major items of equipment relevant to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(7) **Security.** Proposals should not contain security classified material. If the research requires access to, or may generate, security classified information, the submitter will be required to comply with Government security regulations.

(8) **Current Support.** For other current projects being conducted by the applicant and mentor, provide title of project, sponsoring agency, percent effort and ending date.

(9) **Special Matters.** Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(10) **Length.** Unless otherwise specified in the NSBRI-RFP, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 10 pages. Necessary detailed information, such as reprints, should be included as attachments.

(11) **Withdrawal.** Applications may be withdrawn by the applicant at any time before award. Offerors are requested to notify the NSBRI if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(12) **Selection for Award.**

(12.1) When an application is not selected for award, the applicant will be notified. The NSBRI will explain generally why the application was not selected. Applicants desiring additional information may contact the selecting official who will arrange a debriefing.

(12.2) When an application is selected for award, negotiation and award will be handled by the NSBRI in the funding installation. The application is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(13) **Cancellation of NSBRI-RFP.** The NSBRI reserves the right to make no awards under this NSBRI-RFP and to cancel this NSBRI-RFP. The NSBRI assumes no liability for canceling the NSBRI-RFP or for anyone's failure to receive actual notice of cancellation.

APPENDIX D
NSBRI-RFP-06-01

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

PRIMARY COVERED TRANSACTIONS

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 14 CFR Part 1269.

A. The applicant certifies that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not, within a three-year period preceding this application/application proposal been convicted or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph A.(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal, had one or more public transactions (Federal, State, or Local) terminated for cause or default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

C. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lowered Tier Covered Transactions (Subgrants or Subcontracts)

a) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

b) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

CERTIFICATION REGARDING LOBBYING

As required by S 1352 Title 31 of the U.S. Code for persons entering into a grant or cooperative agreement over $100,000, the applicant certifies that:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of, the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, in connection with making of any Federal grant, the entering into of any cooperative, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting an officer or employee of any agency, Member of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants and cooperative agreements, and subcontracts), and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by S1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

CERTIFICATION OF COMPLIANCE WITH THE NASA REGULATIONS PURSUANT TO NONDISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

The (institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant") hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S. 794), and the Age Discrimination Act of 1975 (42 U.S. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participating in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognizes and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.